irreversible decision that would impact an enormous number of existing microwave users.

The FCC's final factor--international considerations--also does not prohibit the FCC from considering bands other than the 2 GHz band for its spectrum reserve. Manufacturing interests should not interfere with what is in the best interests of the U.S. society. It is important to note that none of the personal communications systems currently being developed in Europe or in Japan are designed for interoperation.[41/] As noted by API, it is an oversimplification to believe that a common frequency allocation will provide international interoperability.[42/] With or without interoperability, U.S. manufacturers can easily adjust manufacturing lines to the degree necessary to make equipment operable in other countries. It is unnecessary for the U.S. to strive for the same frequency usage for new technologies.

None of the factors enumerated by the FCC in guiding its band selection, either separately or in combination, prohibit the FCC's serious consideration of an alternative to the 2 GHz band for a spectrum reserve. In fact, close

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[41/] Texas Gas Transmission Corporation (Texas Gas), p. 4.

[42/] API, p. 24.

analysis of the factors reviewed by the FCC even further indicate that the FCC's predisposition to the 2 GHz band is unwarranted.

B. The OET Spectrum Study Is Deficient

UTC's comments pointed out that a fundamental deficiency in the spectrum reserve proceeding is that virtually all of the proposals in the NPRM are based on a wholesale adoption of the OET Study's recommendation that the spectrum reserve be located in the 2 GHz band, and yet the NPRM does not invite comment on the choice of this band or alternative bands.[43/] The comments of Vanguard Cellular Systems (Vanguard Cellular) echo UTC's concern that the OET Study is merely an internal staff report.[44/] Therefore, if the Commission were to adopt the Study's recommendations as to the most appropriate location for the spectrum reserve without inviting public comment on this decision it would be a violation of the Commission's own rules and the Administrative Procedure Act (APA).

A number of commenters agree with UTC that the Commission should solicit comments on the choice of the 2

[43/] While footnote 10 of the NPRM does request comment on the OET Study, it does not specifically request comment on the choice of the band.

[44/] Vanguard Cellular, p. 17.

GHz band as the spectrum reserve and invite recommendations for alternatives to the 2 GHz band as the "home" for the spectrum reserve. For example, the United States Department of Energy (DOE) indicated that the Commission's proposals did not appear to have given adequate consideration to other portions of the spectrum as candidate bands for emerging technologies.[45/] As UTC pointed out in its comments, to not invite public comment on these issues is to deny the possibility that the Commission could be persuaded to select another band as the spectrum reserve, which would be tantamount to an admission by the Commission that it has prejudged the issue and abused the rulemaking process.

UTC characterized the OET's Study as seriously flawed, highly subjective, and result-oriented. UTC cited the inexplicable short shrift that the Study gave to consideration of bands between 1 and 3 GHz other than the 2 GHz point-to-point microwave bands. UTC argued that neither the OET Study nor the NPRM adequately addressed the use of the 2.50-2.69 GHz, 2.45-2.50 GHz or 1.99-2.11 GHz bands. As detailed in UTC's comments, all of these bands meet the OET's five threshold evaluative factors and should therefore be considered as possible alternative locations for the development of emerging technologies. A large

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[45/] DOE, p. 2.

number of commenters support UTC's position and fault the Commission's OET Study for not fully exploring the use of all bands between 1 and 3 GHz. AAR, API, GTE Service Corporation (GTE) and LPPC for example, all criticize the OET Study's failure to thoroughly consider the suitability of alternative bands below 3 GHz to be designated as the spectrum reserve.[46/]

In addition to its failure to adequately consider alternative bands for the spectrum reserve, a number of commenters catalogued a host of deficiencies and flaws in the OET's overall analysis. The OET Study's "block analysis" of microwave usage levels in the 2 GHz band is criticized as being of questionable validity. Alcatel Network Systems (Alcatel) states that a critical flaw in the OET analysis is that it treats all cities the same and ignores differences in population distribution and terrain factors. Differences in population density and terrain can create substantial variations in microwave usage patterns from city to city. Alcatel argues that accurate frequency planning and path design require careful consideration of each individual case. Thus, the OET Study arrives at

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[46/] AAR, p. 21; API, p. 8; GTE, p. 10; and LPPC, pp. 23-27.

conclusions which any experienced path designer knows are not true, and make no sense.[47/]

Similarly, the Public Safety Microwave Committee (PSMC) points out that OET's grid analysis incorrectly assumes that microwave transmitters and receivers are equally distributed in each grid. In fact, claims PSMC, microwave facilities tend to be grouped together on hilltops, tall buildings and existing multi-user communications towers. This co-location of microwave facilities creates parallel or near-parallel paths, which substantially reduces the ability to reuse spectrum within a particular grid. Therefore argues PSMC, the actual frequency availability in a particular grid is likely to be significantly less than the theoretical frequency availability indicated by the OET analysis.[48/]

Another flaw in the OET Study that is cited by a number of commenters is the Study's reliance on average path lengths. As the National Rural Electric Cooperative Association (NRECA) asserts, the use of average path

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[47/] Alcatel, pp. 20-21. In the Second Report and Order in GEN Docket No. 90-54, 6 FCC Rcd 6792 (1991), the Commission stated that it does "not believe that a uniform standard can be established to determine suitability [of a microwave relocation band] in all cases, due to widely differing conditions," such as congestion, poor propagation, expensive equipment, and signal quality requirements.

[48/] PSMC, pp. 17-18.

lengths ignores the many longer paths that are located in the 2 GHz band that could not be accommodated in higher microwave bands absent additional relay stations (hops), resulting in more potential failure points and longer signal processing times.[49/] The OET's reliance on average path lengths in conducting its analysis is a further indication of the Commission's failure to adequately and realistically assess the impact of its spectrum reserve proposal on the individual users of the 2 GHz band. For example, Arizona Public Service Company (APS) has eighteen 2 GHz microwave stations with path lengths exceeding 70 miles and two 2 GHz stations with path lengths over 118 miles.[50/] Thus, the OET average path length analysis is wholly inadequate in terms of APS, yet this analysis is being relied upon by the Commission for the formulation of rules that will directly impact licensees such as APS.

As will be discussed in greater detail below, in calculating the amount of available replacement spectrum for existing users of the 2 GHz band the OET Study ignored the technical and operational suitability of the microwave bands above 3 GHz. For example, the OET Study suggests that existing 2 GHz microwave users can be relocated to the 4 GHz band, however, as Comsearch and others point out, the

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[49/] NRECA, p. 6.

[50/] APS, p. 1.

Study failed to consider the large number of satellite earth stations in the band.[51/]

The OET Study was also sharply criticized regarding its relocation cost estimates. A number of commenters argue that the Study's estimates are extremely low and that the actual costs to relocate the existing 2 GHz microwave users from the 2 GHz band would be significantly more expensive. McCaw points out that the Study's reliance on averages costs may vastly underrepresent the actual costs imposed on individual licensees with a large number of facilities whose individual relocation situations may involve costs at the high end of the range identified by the OET.[52/] Further, Associated PCN Company (APCN) cites a study that it commissioned which found that the minimum relocation costs for all 29,000 existing 2 GHz microwave users would be several billion dollars more than the OET estimates.[53/]

In its comments, McCaw lists a number of factors that the OET study either underestimated or ignored altogether:

- The Study assumes average equipment ages.

[51/] Comsearch, pp. 2-3.

[52/] McCaw, p. 33.

[53/] APCN, p. 8.

- After acknowledging that 2 GHz frequency sensitive equipment would cost $125,000 to $150,000, OET inexplicably uses the lower figure in its calculations.
- OET recognizes that the majority of existing high performance antennas in the 4 and 6 GHz band range in cost from $3,000 to $30,000, yet the Study then uses a price differential of only $15,000 for calculating average costs.
- The Study does not account for the extra cost of adding space diversity antennas necessary to meet reliability requirements.
- OET does not account for costs that would be incurred to convert a single hop path to a multiple hop link.
- OET does not include costs of planning, redesigning and constructing new microwave facilities at higher bands.
- OET ignores the need for continuous service during the changeover which will increase the cost.
- OET ignores lost opportunity costs; that is, a microwave licensee's employees and resources will be diverted from its primary business to make the changeover.[54/]

Finally, Alcatel and others point out that in making its relocation capacity calculations the OET Study fails to account for the natural growth of the microwave bands above 3 GHz. Alcatel argues that OET must consider demand levels and must attempt to estimate the projected needs of microwave users over the next 10-15 years.[55/]

[54/] McCaw, pp. 33-36.

[55/] Alcatel, p. 22.

Upon only a cursory examination of the comments it is evident that the OET Study is grossly deficient in many respects. Thus, the current NPRM which is based in large part on the OET Study is itself seriously flawed and should be reconsidered. Alcatel correctly emphasizes that if challenged the Commission must justify the results and assumptions of its Study. Alcatel points out that the Commission is required to:

> Sufficiently explain the assumptions and methodology used in preparing the model: it must provide a "complete analytic defense of its model [and] respond to each objection with a reasoned presentation." The technical complexity of the analysis does not relieve the agency of the burden to consider all relevant factors and to identify the stepping stones to its final decision. There must be a rational connection between the factual inputs, modeling assumptions, modeling results and conclusions drawn from these results. Sierra Club v.Costle, 657 F.2d 298, 333 (D.C. Cir. 1977).[56/]

Furthermore, if the Commission proceeds with adopting the proposals in its NPRM, based upon the flawed results of the OET Study it would be acting in an arbitrary and capricious manner in violation of the APA.[57/]

[56/] Alcatel, p. 33.

[57/] Alcatel, p. 33, citing St. James Hospital v. Heckler, 760 F. 2d 1460, 1468 (7th Cir.), cert. denied, 474 U.S. 902 (1985), and Humana of Aurora, Inc. v. Heckler, 753 F.2d 1579, 1583 (10th Cir.), cert. denied, 474 U.S. 863 (1985) ("When an agency adopts a regulation based on a study...which is limited and criticized by its authors on points essential to use sought to be made of it, the administrative action is arbitrary and capricious and a clear error in judgment.").

C. Proposed Reallocations

1. Other Parties Support Examination Of Other Bands For Establishment Of A Spectrum Reserve

In its comments UTC argued that under an objective analysis, the 2.5-2.69 GHz, 2.45-2.50 GHz, and the 1.99-2.11 GHz bands satisfy all of the Commission's initial selection factors, and should be considered as candidates for the spectrum reserve. Therefore, UTC advocated that prior to adopting any final reallocation rules, the Commission should conduct a thorough cost/benefit analysis regarding the use of these bands as the spectrum reserve. UTC suggested that any such analysis should consider the financial, operational and societal impact of locating the spectrum reserve in these bands as opposed to the 2 GHz band.

The need for further consideration of these other bands was expressed by many commenters. API for example, strongly urges the Commission to consider both the 2.5 GHz and the 1.99 GHz bands.[58/] The Cellular Telecommunications Industry Association (CTIA) states that the FCC does not have sufficient information before it to conclude that the use of spectrum for auxiliary broadcast

[58/] API, pp. 9-11.

or wireless cable is of greater value than emerging technologies that would be placed in those bands.[59/]

a. Comparison of the 2.5 GHz Band to the 2 GHz Band

UTC argued that from a true cost/benefit analysis point-of-view the 2.5 GHz band appears to be a much more suitable location for the spectrum reserve. It appears that a large number of commenters agree with UTC. API for example, points out that while there are a number of applications pending for use of this band, relatively few have been granted and, accordingly, the band could accommodate emerging technologies more quickly and at a substantially lower cost than the 2 GHz band.[60/] API also maintains that a high percentage of the licensed wireless cable systems are non-operational. API cites Microband Corporation of America (MCA) as an example of the lack of use of the band. According to API, MCA is the largest wireless cable licensee in the nation, but only has subscribers on 23 percent of its licensed stations.[61/] Thus, it does not appear that a reallocation of this band will significantly disrupt service to a large portion of the public.

[59/] CTIA, p. 8.

[60/] API, p. 9.

[61/] API, p. 10.

The Wireless Cable Association (WCA) objects to any consideration of the 2.5 GHz band as the spectrum reserve. WCA claims that there is no alternative spectrum capable of satisfying the needs of the wireless cable industry.[62/] WCA opposes UTC's suggestion that wireless cable systems could be relocated to other, higher frequencies such as the 3.7-4.2 (4 GHz), 5.925-6.425 (6 GHz), 10.7-11.7 (11 GHz), 11.7-12.2 (11.7 GHz), 12.7-13.25 (12 GHz), 17.7-19.7 (18 GHz), 21.2-23.6 (23 GHz), or 27.5-29.5 (28 GHz) GHz microwave bands.[63/] WCA argues that there is no evidence that wireless cable operations could operate in a satisfactory manner in the higher microwave bands.[64/] As UTC stated in its comments, this argument ignores the fact that the Commission itself has already determined that some licensed facilities in this band could be relocated to higher frequencies. In its Second Report and Order in GEN. Docket No. 90-54, 6 FCC Rcd 6792 (1991), the FCC adopted an involuntary migration plan for Instructional Television Fixed Service (ITFS) systems licensed on channel groups E and F. In adopting the Second Report and Order in GEN. Docket 90-54, the FCC specifically suggested the 7, 13, 18

[62/] WCA, p. 4.

[63/] UTC first suggested that these bands could be used to accommodate wireless cable operations displaced from the 2.5 GHz band in its May 1, 1992, "Petition for Issuance of Further Notice of Proposed Rulemaking," in ET Docket No. 92-9.

[64/] WCA, pp. 4,7.

and 23 GHz bands as possible replacement bands for displaced ITFS systems.[65/] While the ITFS systems impacted by the Commission's action are point-to-point and not point-to-multipoint, there is no evidence offered by WCA that point-to-multipoint systems require spectrum with different propagation characteristics than those of point-to-point systems. In fact, point-to-point microwave systems traditionally have longer path lengths requirements then point-to-multipoint systems.

Further, the Commission recently adopted rules regarding the use of the 18 GHz band for the distribution of video entertainment material.[66/] While the primary intended beneficiary of these new rules was satellite master antenna television (SMATV) operators, this band would be equally suitable for relocated 2.5 GHz wireless cable operations. Since there are no limitations on the number of 18 GHz channels that may authorized for video use at a single site, use of sectorized antenna systems could provide adeaute coverage even under the current rules.

WCA claims that UTC's advocacy of 28 GHz band as a possible home for wireless cable is flawed because UTC does

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[65/] Second Report and Order, GEN. Docket 90-54, FCC 91-302, para. 32.

[66/] Report and Order in PR Docket 90-5, 6 FCC Rcd 1270 (1991).

nothing more to bolster its position than to cite to the Commission's decision authorizing Hye Crest Management, Inc. to operate a 28 GHz band cellular video system. WCA argues that it has been established that thus far there is no evidence that cellular video in the 28 GHz band will work. The basis for WCA's assertion is comments that it filed in oposition to a Commission rulemaking on the use of the 28 GHz band.[67/] WCA's arguments on this point are unconvincing and parochial. The fact is that the Commission has granted a license to operate a type of wireless cable system in the 28 GHz band, and the FCC currently has a pending rulemaking petition regarding the adoption of rules for the use of this band.[68/] To date, the Commission has not concluded that 28 GHz will not work, and its actions in granting the Hye Crest application and placing the Suite 12 Petition for Rulemaking on public notice indicate the Commission's belief that there is at least some merit to this proposal. However, the OET Study ignores the 28 GHz band as a possible replacement band for wireless cable.

API agrees with UTC that it appears that the existing wireless cable operations in the 2.5 GHz band could

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[67/] WCA, p. 6.

[68/] Suite 12 Petition for Rulemaking, RM-7872.

satisfactorily be accommodated in higher frequency bands.[69/] Furthermore as API argues, even if a migration of wireless cable systems to higher frequencies results in slightly lower transmission distance and/or service reliability levels, wireless cable services do not need the absolute reliability levels required of 2 GHz microwave operations to protect the public health and safety.[70/]

WCA also fails to recognize that under the Commission's guidelines to establish a spectrum reserve, the replacement of existing services need not be accomplished through identical technologies or be spectrum dependant. CTIA points out that the service that wireless cable provides is readily transferable to fiber optics or wire based media.[71/] The use of satellite video transmission systems, fiber optics or wire based media would arguably provide equivalent or superior replacement service to existing wireless service. As UTC pointed out in its May 1, "Petition for Issuance of a Further Notice of Proposed Rulemaking" the average consumer does not care whether video is delivered via satellite, microwave or wire.

[69/] API, p. 10.

[70/] API, p. 10.

[71/] CTIA, p. 8.

The objections of existing users of the 2.5 GHz band regarding the cost of moving to higher frequency bands or alternate technologies have merit and are legitimate concerns. However, their concerns should not be given any greater weight or credence than similar concerns of the 2 GHz microwave users. The Commission's ultimate decision regarding payment of relocation expenses must therefore be band-neutral. Thus, given that there are only about 1/10 as many facilities licensed in the 2.5 GHz band as in the 2 GHz band, total relocation costs for the 2.5 GHz band should be just a fraction of the relocation costs for the 2 GHz band. Therefore from a financial analysis the 2.5 GHz band would be a better location for the spectrum reserve, regardless of whether the expense is borne by incumbents or new technology proponents.

In any event, and as UTC argued in its comments, the operational importance of fixed microwave usage in the 2 GHz band to the nation's core industries outweighs any additional entertainment value that wireless cable operations might provide.

b. Comparison of the 2.45-2.5 GHz Band to the 2 GHz Band

UTC's comments supported a cost/benefit analysis regarding the use of the 2.45-2.5 GHz Industrial, Scientific, and Medical (ISM) band as the spectrum reserve. As UTC pointed out in many respects the ISM band would appear to be an ideal candidate for the spectrum reserve. The band is already available for operation of Part 15 devices and therefore could accommodate those emerging technology proposals that would operate on an unlicensed basis without forcing the existing users of the band to relocate. In particular, technologies proposing to utilize a coded spread spectrum access technology on an unlicensed basis may be well suited for this band, since they could overlay the existing "noise" and filter out any interference that they might receive from other Part 15 devices.

c. Comparison of the 1.99-2.11 GHz Band To The 2 GHz Band

UTC argued that consideration of the 1.99-2.11 GHz auxiliary broadcast band was given short shrift as a possible location for the spectrum reserve. The 1.99-2.11 GHz band is used primarily for electronic news gathering (ENG) by broadcasters and cable operators. A number of broadcasters filed comments opposing any further

consideration of the 1.99-2.11 GHz band. The sum and substance of virtually all of these comments is that the 1.99-2.11 GHz auxiliary broadcast band cannot be used for emerging technologies because: broadcasters have invested a large amount of money in auxiliary broadcast equipment; there is insufficient replacement spectrum to meet anticipated needs; and because a relocation would force broadcasters to less desirable bands which would degrade their service.[72/] These same objections have been raised by private microwave users, and have thus far been ignored by the Commission. The broadcasters' arguments should be entitled to no special deference by the Commission. Instead, their arguments should be viewed objectively as part of a cost/benefit analysis regarding the use of the 1.99-2.11 GHz band as the spectrum reserve.

As UTC pointed out in its comments the financial cost of relocating existing users of the 1.99-2.11 GHz band would be significantly lower than the cost to relocate the private and common carrier microwave operations in the 2 GHz band. According to the "XFS" database used in the OET Study, there are less than 3,300 licensed stations in the

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[72/] Association for Maximum Service Television (MSTV); Columbia Broadcasting Corporation (CBS); Capital Cities/ABC; Joint Comments of the National Association of Broadcasters (NAB), Radio-Television News Directors Association (RTNDA), Cable-Satellite Public Affairs Nertwork (CSPAN), MSTV, and Turner Broadcasting; and Westinghouse Broadcasting Company.

1.99-2.11 GHz band, and according to the NAB, the total broadcast industry investment in this band is approximately $158 million.[73/] It is three times as expensive to convert ENG operations from microwave to satellite.[74/] Thus, UTC noted under a worst-case scenario, with all facilities in the 1.9-2.11 GHz band converting to satellite operation, the total relocation cost of 1.99-2.11 GHz broadcast facilities would be less than $500 million. This figure is substantially less than the estimated $5 billion industry investment that would be required to relocate the 29,000 existing 2 GHz microwave facilities. Moreover, UTC noted that not all of the systems licensed in the 1.99-2.11 GHz band would have to be replaced by satellite since a large number of these systems are fixed and could be relocated to other microwave bands at lower cost. Further, Motorola notes that ENG systems, while licensed as "mobile" generally operate as temporary fixed links using directional transmit antennas.[75/]

More importantly, UTC argued that while the Study noted the use of the auxiliary broadcast band for the

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[73/] Report on the NAB 2 GHz Auxiliary Facilities Survey, January 7, 1992.

[74/] WJZ13 ENG Operations Overview, submitted in response to the OET's request for information on the 1.99-2.11 GHz band as part of its feasibility study.

[75/] Motorola, p. 8.

reporting of fast-breaking news events such as accidents, fires and natural disasters, the OET Study failed to recognize that it is precisely during these "news events" that use of the 2 GHz microwave band is crucial to the public safety and public service entities that are attempting to deal with these emergencies. API characterizes the Commission's apparent assignment of a greater societal value to broadcast news coverage than to the protection of public safety and the environment as arbitrary.[76/]

The 1.99-2.11 GHz band was also identified by a number of other commenters as being worthy of further analysis as a possible location for the spectrum reserve. LPPC points out that OET dismissed the auxiliary broadcast band because of a possible increase in need for this band by broadcasters when Advanced Television (ATV) is introduced even though OET admitted that "there is considerable uncertainty with regard to the demand for broadcast auiliary service. As a result, the future requirements of the broadcast auxiliary services for operating spectrum are not known."[77/] Thus, as LPPC asserts, without knowing the future spectrum requirements for ATV, the Commission has no basis for eliminating the 1.99-2.11 GHz band from

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[76/] API, pp. 11-12.

[77/] OET Study, p. 10.

consideration.[78/] It should also be noted that it is inconsistent and unjust for the Commission to consider the speculative future needs of the broadcast industry, and not analyze the expected growth in the use of private microwave. Commenter's such as AGA, and APPA point to recently enacted Federal regulations and policies that will increase the need for private microwave systems to provide reliable real-time communications for the energy and utility industries.[79/]

AAR notes that the FCC did not thoroughly analyze the availability of suitable replacement spectrum for existing 1.99-2.11 GHz auxiliary broadcast services. AAR points out that the OET Study identified the 7 GHz band as a candidate relocation band for broadcast auiliary services but rejected it as being insufficient to accommodate the anticipated demand of ATV. AAR, like LPPC, argues that at present, there is no basis for assuming that in the future the auxiliary broadcast services will require more, less or the same amount of spectrum.[80/] AAR also notes that in addition to the 7 GHz band, Table 2 of the OET Report identified the 6425-6525 MHz band as a candidate relocation band for fixed auxiliary broadcast services, yet neither

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[78/] LPPC, p. 25.

[79/] AGA, pp. 8-9; and APPA, p. 2.

[80/] AAR, p. 25.

the OET Report nor the NPRM mentions the possible use of this band.[81/] Thus, in eliminating the 1.99-2.11 GHz band from consideration as the spectrum reserve, the Commission failed to adequately address the use of all possible relocation bands for displaced auxiliary broadcast services.

Accordingly, it is apparent that a number of commenters agree with UTC that from a true cost/benefit analysis that considers the financial, societal, and operational impact of the various bands, the 2.5 GHz, 2.45-2.50 GHz, and 1.99-2.11 GHz bands are all more appropriate locations for the spectrum reserve than the 2 GHz band.

2. Other Parties Agree That The NPRM Does Not Propose To Make Adequate Replacement Spectrum Available

If, despite the foregoing analysis, the 2 GHz band is ultimately selected as the location for the spectrum reserve, the Commission must take steps to ensure that there is appropriate and adequate replacement spectrum with equivalent reliability to the 2 GHz band in place for use

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[81/] AAR, p. 26.

by displaced users prior to making any actual reallocation of the band.[82/]

As UTC pointed out in March 31, 1992, "Petition for Rulemaking,"[83/] and in its comments on this docket, the Commission's present relocation proposals are wholly inadequate. At present, the Commission proposes only to "make available" all fixed microwave bands above 3 GHz, in both common carrier and private bands, for reaccommodation of displaced 2 GHz systems.

The inadequacy of this proposal was observed by many of the commenters.[84/] INGAA notes that the Commission's confidence in the viability of frequencies above 3 GHz is misplaced. INGAA points out that frequencies above the 3 GHz range do not provide the long-haul transmission capabilities that the 2 GHz band provides. Thus, argues

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[82/] One commenter noted that the Commission must also assure parties relocating to other microwave bands that these bands will not be precipitously withdrawn to create yet more "reserve" spectrum for future technology. Southern Natural Gas, p. 2.

[83/] On May 1, 1992, the FCC issued a Public Notice designating UTC's petition as RM-7981, and solicited comments and reply comments on June 1, and June 16, 1992 respectively.

[84/] AAR, p. 37; Alcatel, pp. 11-23; American Gas Association (AGA), pp. 8-9 ; API, p. 15; American Public Power Association (APPA), p. 12; CTIA, pp. 5-6; EEI, pp. 12-15; GTE, pp. INGAA, p. 8; LPPC, p. 37; McCaw, pp. 17, 26-29; NRECA, pp. 6-7; OCOM, pp. 3-8; Pacific Telesis, p. 17; SBC, pp.7-9; US West, pp.16-17; Vanguard Cellular, p. 16, to name a few.

INGAA, replacement with higher frequencies will require operators to implement thousands of additional relay hops in order to meet existing path length requirements. The addition of every such hop will further compromise the reliability of the communications system by introducing additional failure points.[85/]

In addition to the inability of higher microwave bands to accommodate longer path lengths, these frequencies are also more susceptible to rainfall attenuation and temperature inversions. This was cited as a specific reason for the selection of the 2 GHz microwave band for Atlantic Electric's microwave system. Atlantic Electric notes that the 2 GHz frequency is less affected by the severe weather conditions experienced in its Southern New Jersey peninsula location.[86/]

Further, as EEI notes, there is a large difference between what is technically possible, and what is practically feasible. EEI points out that a myriad of factors must be considered, on a path by path basis, to determine if a particular alternative is practically feasible to implement. A solution that works for one path

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[85/] INGAA, pp. 7-8.

[86/] Atlantic Electric, p. 3.

may be totally inappropriate or impossible for another.[87/]

An example, of the need to consider microwave user needs on a path by path basis is provided by APPA. APPA reports that one of its member utilities, Santee Cooper, recently constructed a 6 GHz loop along South Carolina's Atlantic seaboard. To date, the system has not provided satisfactory reliability. APPA reports that Santee Cooper's engineers explain that temperature inversions and high humidity have caused fading in excess of the system design.[88/]

As Santee Cooper illustrates, Utilities and other microwave users must have a number of options available to them in order to engineer a system that best meets their individual operational needs. It is a mistake to assume, as the Commission's NPRM, that all microwave systems and spectrum are fungible.

One of the few commenters to argue that the proposed replacement spectrum is adequate is Motorola. As part of its comments Motorola submitted a report entitled "Reliability Comparisons For 2 and 6 GHz" which claims to

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[87/] EEI, pp.12-13.

[88/] APPA, pp. 12-13.